PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Multiple Motor Drive for Aircraft

We, MENASCO MANUFACTURING COMPANY, a corporation duly organized under the laws of the State of California, of 6718, McKinley Avenue, Los Angeles, State of California, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a multiple motor drive particularly applicable to provide the driving mechanism of the propeller of an aircraft.

It is a common practice to employ a group of propellers, for example, two or three, for driving an aircraft; and each propeller is usually driven by its own motor by driving means which is independent of all of the other motors and propellers. As a result of this, if one of the motors becomes inactive for any reason, the drive for the aircraft becomes unbalanced, and this unbalanced condition is aggravated by the fact that the propeller of the "dead" or idling motor is not rotating. The failure of independent driving units on aircraft such as this, has been the cause of many forced landings and many accidents.

The present invention is concerned with a driving mechanism for a propeller of an aircraft, in which a single propeller is driven by a group of motors, and in such a way that if any one of the motors becomes incapacitated the other motors will continue the driving of the propeller, and without rotating the "dead" motor. The improvement may be applied to an aircraft driven by a single propeller actuated by a group of motors, and it is also quite applicable to an aircraft design in which the aircraft is driven by a plurality of propellers, for example, two or three, each propeller being driven by its own group of motors. In either case, if one of the motors becomes incapacitated the propeller will continue to revolve under power. Where the improvement is applied to an aircraft which is driven by several propellers, the incapacitating of one of the motors would merely reduce the power of the drive to the propeller driven by one group of motors, and it would be substantially impossible for an accident to be so extensive as to bring about the incapacity of any propeller.

While our improvements may be applied in the power plants of commercial aircraft, they are also useful when applied in connection with military aircraft, and one of the objects of the invention in this connection, is to provide an improved multiple drive or group drive of a propeller, from a plurality of motors arranged in such a way that the group driving will not interfere with firing a machine gun through the propeller shaft.

It has already been proposed to insert clutches between the ends of the several motor shafts of an aircraft and the propeller shaft. The present invention is directed to a new arrangement of these motors, and their shafts relatively to the propellor shafts and their gearing.

According to the present invention we provide a multiple motor drive for aircraft of that type in which individual motors are operatively associated with a propeller shaft through clutches adapted for automatic engagement and disengagement, characterized by the fact that the shafts of the motors are out of axial alinement with the propeller shaft, each motor shaft having a driving pinion and a clutch in the form of an overrunning one-way driving clutch, the clutch being located between the motor shaft and its driving pinion.

A preferred embodiment of the invention is described in the following specification.

In the accompanying drawing:

Figure 1 is a plan of a more or less diagrammatic nature, indicating the relation of two motors with driving means for driving a propeller shaft from the same in accordance with our invention. In this view certain parts are broken away, and certain parts shown partially in section; the propeller is indicated in dotted lines.

Fig. 2 is a front elevation of the parts illustrated in Fig. 1, but omitting the outline of the motors at the back. This view particularly illustrates the direction

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of rotation of the motor shafts and the propeller shaft.

Fig. 3 is a fragmentary view and is a partial section similar to Fig. 1, and illustrating an embodiment of the invention in which the motor shafts are inclined with respect to the propeller shaft. This arrangement gives an increased amount of space between the motors at the rear of the propeller shaft, and particularly adapts the invention for use in military aircraft where a machine gun is to be fired through the bore of the propeller.

Although any number of motors may be employed for driving one of the propellers of the aircraft in the present specification and drawing we have described the improvement as applied to the construction in which two motors are employed for driving the propeller shaft.

Referring more particularly to the parts and especially to Figs. 1 and 2, 1 indicates the propeller shaft which would be mounted in suitable bearings, and which projects at the forward end so as to carry a propeller 2 indicated in dotted lines in Fig. 1.

In the present instance this shaft 1 is driven by two motors 3, which may be of any type, and these motors are mounted so that their shafts 4 are out of axial alignment with the shaft 1. As illustrated in Fig. 1, the shafts 4 are parallel with the sahft 1, but this is not essential to the practice of the invention, as will appear hereinafter. Between the motor shafts 4 and the propeller shaft 1, we provide gearing for driving the propeller shaft from each motor shaft, and this gearing includes an overrunning or one-way drive clutch so that the power of the two shafts 4 can be transmitted to the propeller shaft. In the present instance this gearing comprises a main gear wheel 5 rigid with the propeller shaft 1. Each motor shaft 4 is provided with a driving pinion 6 meshing with the gear wheel 5 for driving the same, but this pinion 6 is not rigid with its corresponding motor shaft 4, but is driven from the same through an overrunning clutch 7 preferably including a plurality of rollers 8 (see Fig. 2), mounted around a cylindrical hub 9 and rolling at their outer sides against a plurality of cam faces 10. Clutches of this type are in common use, and enable the drive to be effected in one direction only. In the present instance, assuming that the propeller shaft 1 would rotate in a clockwise direction, then the two motors would rotate in an anticlockwise direction, as indicated by the arrows in Fig. 2. Each motor shaft 4 is preferably provided with its own fly wheel 11, and in the present illustration this fly wheel is illustrated as being formed integral with a sleeve 12, which sleeve is rigid on the motor shaft 4; and on this sleeve the cylindrical hub 9 is formed that forms a part of the one-way clutch driven by the motor shaft.

In the arrangement of motors illustrated in Fig. 1, it is evident that if desired, more than two motors may be employed for driving the propeller shaft. If the aircraft is intended for military purposes, it is preferable to arrange the motors and the drive for the motors in such a way that more clearance space will be formed just forward of the propeller, so as to accommodate a machine gun. This is illustrated in Fig. 3, in which 1^a and 4^a indicate the propeller shaft and the motor shaft. The motor shaft 4^a is connected up for driving the propeller shaft through the medium of a bevel gear 5^a which meshes with a bevel pinion 6^a, the said bevel pinion 6^a being driven through a one-way clutch 7^a. There would, of course, be two or more motor shafts engaging the gear wheel 5^a for driving the same. This gear wheel, as indicated in Fig. 1, may be made integral with the motor shaft 1^a. The motor shaft could be formed with a central bore 12 with which a machine gun barrel 13 can be aligned for shooting through the propeller.

It will be evident that in either of the embodiments of the invention described herein, if one of the driving motors becomes incapacitated, the other motor or motors of the group will continue the rotation of the propeller shaft. Furthermore, by reason of the overrunning clutches employed, the propeller shaft 1 will not drive the motor shaft. Hence the motor can come to rest and will not be driven by the propeller shaft. This relieves the propeller shaft of considerable friction, and enables the development of a greater amount of power by the remaining active motors for driving the propeller shaft.

One of the advantages of our improvement is that the gear wheels through which the propeller shaft is driven from the motors, are constantly in mesh with each other.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and we do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to

be performed, we declare that what we claim is:—

1. A multiple motor drive for aircraft of that type in which individual motors are operatively associated with a propeller shaft through clutches adapted for automatic engagement and disengagement, characterized by the fact that the shafts of the motors are out of axial alignment with the propeller shaft, each motor shaft having a driving pinion and a clutch in the form of an overrunning one-way driving clutch, the clutch being located between the motor shaft and its driving pinion.

2. A multiple motor drive for aircraft, as set forth in Claim 1, wherein the clutches interposed between the motor shafts and the driving pinions of the same respectively are overrunning clutches while the propeller shaft carries a spur gear in engagement with the said driving pinions, so that when all of the motors are in operation, the overruning clutches cooperate in driving the propeller shaft while upon any one of the motors being inactive, the overrunning clutches permit the drive to be continued through the other motors.

3. A driving gear for aircraft, as set forth in Claims 1 and 2, wherein the overrunning clutch is located within each pinion associated with one of the motors for driving the respective pinion from the corresponding motor shaft.

4. A driving gear for aircraft, as set forth in Claim 1, wherein the motor shafts are angularly related to the propeller shaft, a bevelled gear being coaxial with the propeller shaft and rigid thereon while the individual motor shafts carry bevelled pinions constantly in mesh with the bevelled gear on the propeller shaft, the bevelled pinions of the motor shafts being provided between their rims and their hubs with overunning clutches.

5. A driving gear for aircraft, as set forth in Claims 1 and 4, including a bore through the propeller shaft, to permit the alinement of the barrel of a gun mounted in the space between the angularly disposed motor shafts, with the bore, to shoot through the propeller shaft.

6. A driving gear for aircraft, as set forth in Claim 1, including on each motor shaft a flywheel with an extended hub projecting into the pinion associated with the respective motor shaft, the overrunning clutch being in cooperation with the hub extension and the pinion.

7. A driving gear for aircraft, substantially as described and shown, and for the purpose set forth.

Dated this 14th day of April, 1936.

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Reference has been directed, in pursuance of Section 7, sub-section (4), of the Patents and Designs Acts, 1907 to 1932, to Specifications numbered 427,094, 373,130 (as open to public inspection under Section 91 of the Acts), 304,243, and 177,340.

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Fig. 1

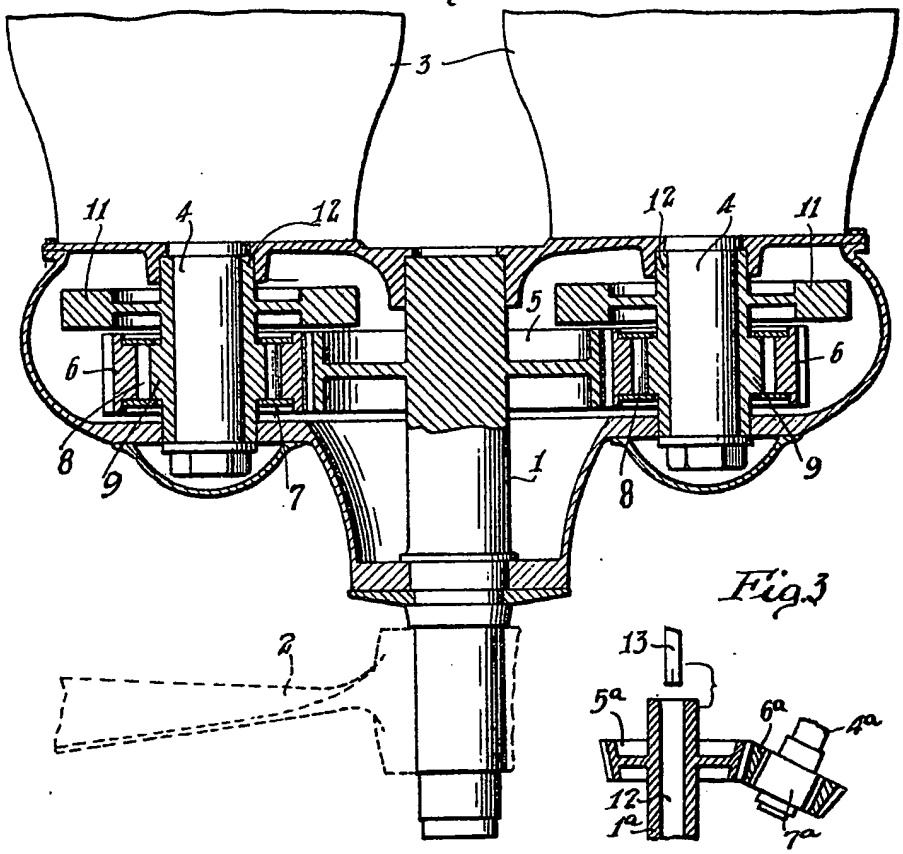
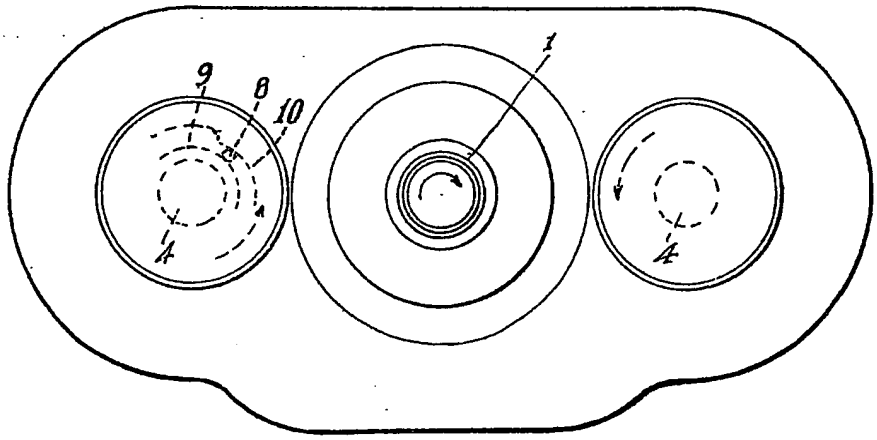


Fig. 3

Fig. 2



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